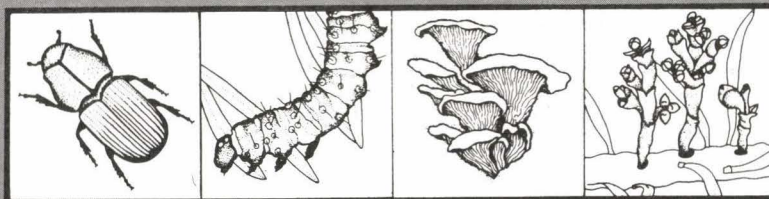


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Forest Pest Management



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WESTERN SPRUCE BUDWORM ON THE NEZ PERCE NATIONAL FOREST SURVEY REPORT 1987-1988

by

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The western spruce budworm, *Choristoneura occidentalis*, is a defoliator of true firs, Douglas-fir, spruce, and larch. This insect causes growth loss, top kill, cone and seed loss, and mortality of its host trees. Epidemics occur periodically as conditions become favorable to the insect, last several years, and eventually collapse due to natural causes. The last spruce budworm epidemic on the Nez Perce National Forest (NF) occurred from 1965-1975. Over a million acres were defoliated annually from 1967-1974 (Fig. 1). In severely damaged stands, 54 percent of the trees were top killed and 19 percent died from budworm defoliation. Periodic annual growth was reduced by 18 percent (Bousfield and Williams 1977).

Since then, very little spruce budworm activity has been seen on the Nez Perce NF until 1987 when 14,411 defoliated acres were detected by aerial surveys. An egg mass survey was conducted in 1987 and 1988 to determine population density and to predict future defoliation. Egg mass density is considered a reliable indicator of future defoliation. This report summarizes budworm conditions and future predictions on the Nez Perce NF.

METHODS

Aerial surveys are conducted in July and August of each year and areas of budworm defoliation visible from the air are rated as light, moderate, and heavy. In September of 1987 and 1988, 11 sites inside or close to defoliated areas were sampled for egg mass density (Fig. 2). At each site, two 18-inch branches were cut from the midcrown of three host trees for a total of six branches per site. The branches were measured and examined under black light for the presence of egg masses. All egg masses found were examined under a binocular microscope to distinguish new egg masses from those of previous years. New egg mass densities per square meter of foliage were computed.

The equation $Y = 15.8 + 10.14 (\text{natural log of } X)$, where Y is percent defoliation and X is egg masses per square meter of foliage, was used to determine next year's defoliation (Bullard and Young 1980). This equation correctly predicts Douglas-fir defoliation 65 percent of the time. Defoliation estimates for grand fir and subalpine fir are expected to be higher.

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WESTERN SPRUCE BUDWORM DEFOLIATION Nez Perce National Forest

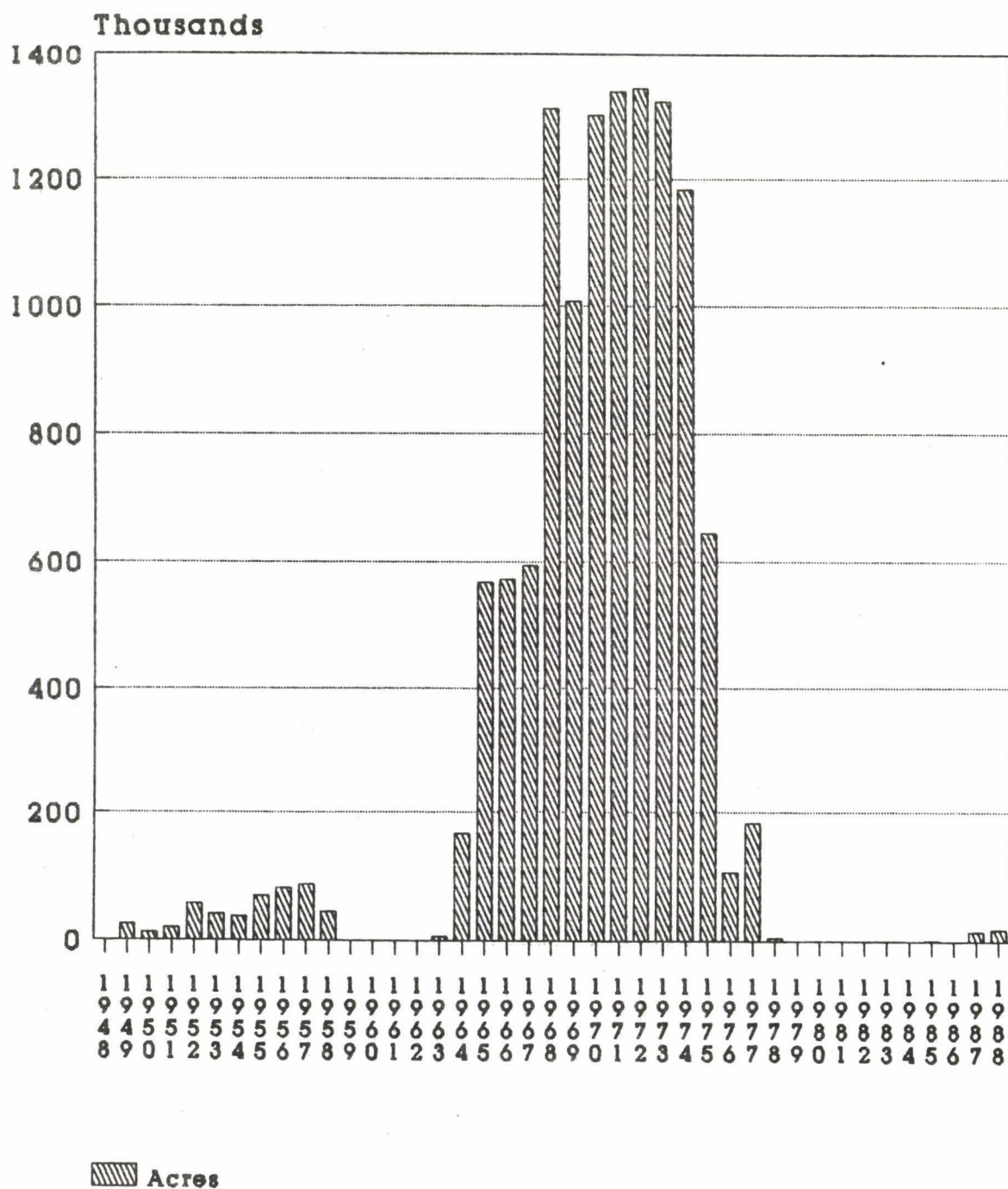


Fig. 1. Annual defoliation detected by aerial surveys from 1948 to 1988.

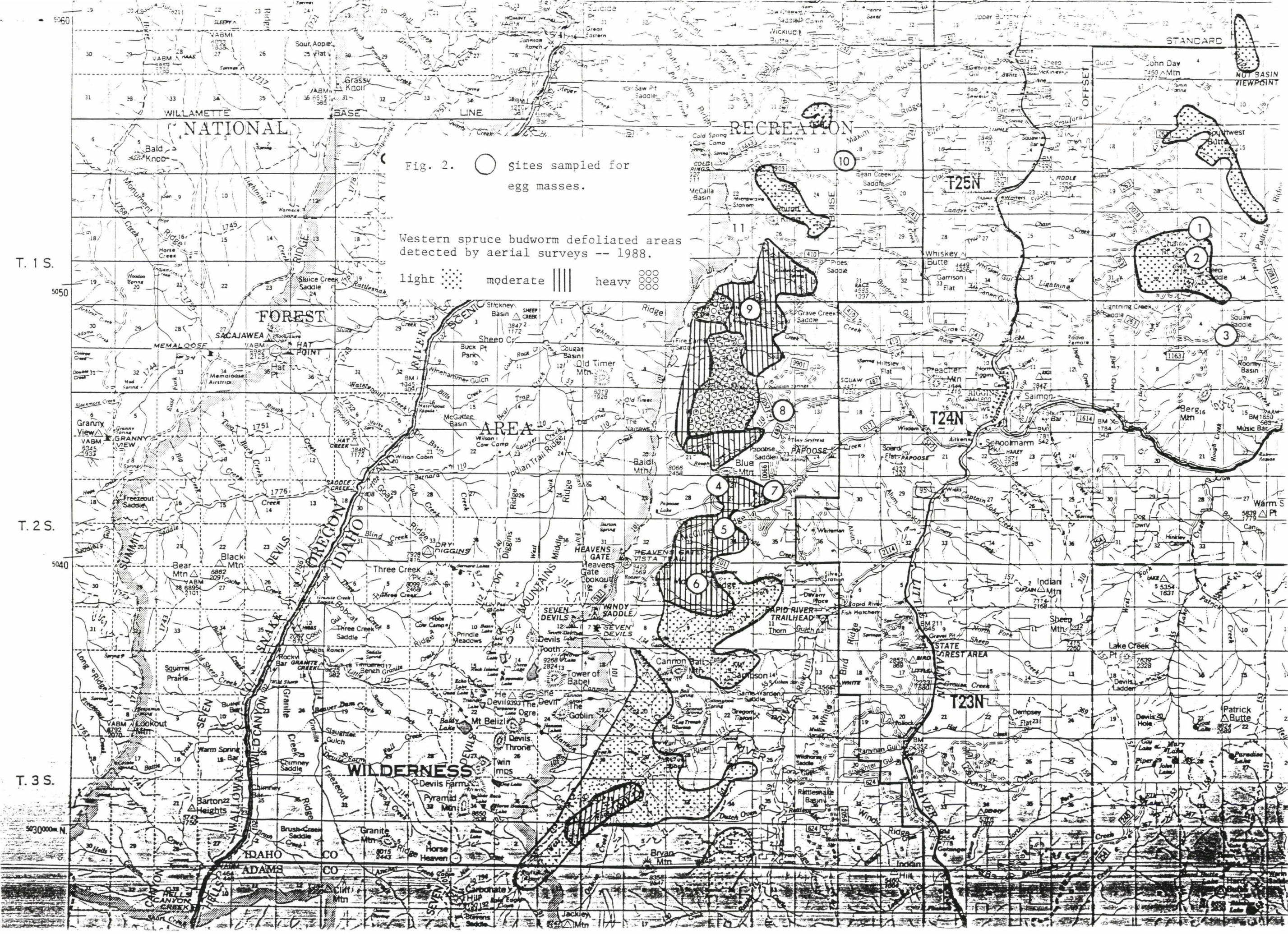


Fig. 2. ○ Sites sampled for egg masses.

Western spruce budworm defoliated areas detected by aerial surveys -- 1988.

light  moderate  heavy 

RESULTS

In 1988, 18,680 acres of defoliation were detected by aerial surveys (Fig. 2). This was an increase of over 4,000 acres above those detected in 1987.

Egg mass densities and predicted percent defoliation from 11 sampled areas are shown by year in Table 1.

Table 1.--Egg mass densities and predicted defoliation on the Nez Perce NF, 1987-1988.

Area	1987 EM/m2	% 1988 predicted defoliation	1988 EM/m2	% 1989 predicted defoliation
1	0.60	11	0	0
2	6.02	34	4.39	31
3	11.50	41	3.11	27
4	2.06	23	6.38	35
5	19.58	46	0.91	15
6	6.33	35	0.77	13
7	0	0	0	0
8	0.50	9	0	0
9	4.60	31	3.80	29
10	6.30	34	2.56	25
11	0	0	0.98	16
Average	5.23		2.08	

DISCUSSION AND RECOMMENDATIONS

Overall, egg mass densities decreased from 1987 to 1988. Average density for all plots was 5.23 egg masses per square meter of foliage in 1987 decreasing to 2.08 in 1988. This could be due to budworm mortality from natural parasites and predators. Based on egg mass densities, the amount of budworm defoliation on the forest is expected to decrease in 1989. However, some local areas may still experience noticeable defoliation.

We recommend continued monitoring of the western spruce budworm through egg mass sampling and aerial surveys. Although control measures are not warranted at this time, the following management actions can reduce western spruce budworm impact.

Silvicultural control

Silvicultural methods offer the best long-term control against losses by the western spruce budworm. The most susceptible forest stands are dense, multistoried, climax host stands. Even-aged silvicultural methods are very effective in reducing budworm habitat. Methods such as clearcut, seed-tree, and shelterwood regeneration harvest cuts establish even-aged seral conifer stands that are not susceptible to the budworm. Stands not yet ready for regeneration cuts can be thinned to improve stand vigor and reduce the amount of host material available to budworm larvae (Carlson and Wulf 1987).

Direct control

When silvicultural treatments cannot be performed quickly enough to prevent excessive resource losses, direct control with an insecticide may be a cost effective alternative. There are several insecticides registered for budworm suppression. *Bacillus thuringiensis* (B.t.) is a naturally occurring bacterium that produces a toxin when ingested by caterpillars. It is specific to caterpillars of moths and butterflies and does not affect budworm parasites, predators, or other non-target organisms. Carbaryl, acephate, and malathion are broad spectrum chemical insecticides that are registered for budworm control, but they will affect non-target insects. All of these insecticides can be effective in temporarily reducing budworm populations.

REFERENCES

- Bousfield, W.E. and R.E. Williams. 1977. Impact of spruce budworm on the Nez Perce National Forest, Idaho, 1976. USDA For. Serv. North. Reg. Rpt. 77-3. 13p.
- Bullard, A.T. and R.W. Young. 1980. Prediction of western spruce budworm defoliation on Douglas-fir. USDA For. Serv. Methods Application Group Rpt. 80-10. 51 p.
- Carlson, C.E. and N.W. Wulf. 1989. Silvicultural strategies to reduce stand and forest susceptibility to the western spruce budworm. USDA For. Serv. Agr. Handbook No. 676. 31p.